

MOUNTAIN ANTS OF NEVADA

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ABSTRACT.—Introductory topics include "The High Altitude Environment," "Ants Recorded from High Altitudes," "Adaptations of Ants," "Mountain Ants of North America," and "The Mountains of Nevada." A Nevada mountain ant species is defined as one that inhabits the Coniferous Forest Biome or Alpine Biome or the ecotone between them. A table gives a taxonomic list of the mountain ants and shows the biomes in which they occur; it also indicates whether they occur in lower biomes. This list comprises 50 species, which is 28 percent of the ant fauna we have found in Nevada. Only 30 species (17 percent of the fauna) are exclusively montane; these are in the genera *Myrmica*, *Manica*, *Stenamma*, *Leptothorax*, *Camponotus*, *Lasius*, and *Formica*. The article concludes with "Records for Nevada Mountain Ants." All known records for each species are cited. For each record we give first the county, next the mountain range, then the peak (or other local feature), and finally the elevation.

EPICRAPHS

"The first compilation of world ants found at elevations of 2000 m (6560 ft) or more shows that, while many species may be found at the 2000 m level, the numbers decrease rapidly with increase in altitude. Few ants are found at 3000 m (9840 ft), and at 4000 m (13,129 ft) or more only nine species are known. The world altitudinal record is of *Formica picea lochmatteri* Starcke at 4800 m. (15,740 ft) in the Himalayas" (Weber 1943: 351).

"While other branches of entomology have made great advances in recent years, our knowledge of the insect life of the North American mountains is, however, extremely fragmentary" (Mani 1968: 365).

ACKNOWLEDGMENTS

As soon as we moved to Nevada in 1967 we began a study of the ants of the state. Most areas were readily accessible, thanks to an excellent highway system and a Jeep Wagoneer. But we soon found that we were too old for hiking and backpacking in the rarified air of the mountaintops.

To remedy this handicap, we applied for and were awarded two National Science Foundation grants to employ students to collect for us. The first was for the Alpine

Biome (BMS74-13679). For this study we hired Alvin McLane (one of Nevada's most experienced mountaineers) and Jane Ramberg (a senior botany major at Wellesley College) for two months during the summer of 1975. The second grant (DEB76-11131) was for the upper levels of the Coniferous Forest Biome. For this study we hired two University of Nevada, Reno, students, Gary Nigro (a graduate entomology student) and Wendy Guyer (a senior botany major) for two months during the summer of 1977.

The above should not be taken to mean that we have had no personal experience with high-altitude ants. We have taken advantage of the excellent gravel road up to 12,000 ft on Mt. Grant (elevation 12,200 ft) near Hawthorne and a passable road up to 10,000 ft on Mount Jefferson (elevation 11,949 ft). There are also many roads up to 9000 ft, but these one-lane roads without turnouts generally lead to mines.

We thank Alvin McLane for reading the manuscript.

DEFINITION

In his book, Mani (1968:8) preferred the term "hypso-biont" or "high altitude" to "alpine" and gives this definition: "The high altitude insects may thus be described as an ecologically highly specialized, mountain

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autochthonous group existing exclusively in the biome above the forest, at elevations above 2000-2500 m." None of our Nevada ants can qualify because of the adverb *exclusively*, so we will use the more modest term *alpine*.

The student of mountaintop faunas must be duly warned (as does Mani, p. 4) that not all insects occurring at high altitudes are hypsobionts: "Incredibly large numbers of insects [even heavy flying insects] are lifted from the lowland by warm updraft air currents to high altitudes, to be chilled dead, blown passively and eventually cast on high mountain slopes." The converse, however, is not true: hypsobionts are rarely encountered on the lowlands.

In this study we define a Nevada mountain ant species as one that inhabits the Coniferous Forest Biome or the Alpine Biome or the ecotone between them. We cannot use an elevational boundary because the lower limit of the forest is too uneven.

HIGH-ALTITUDE ENVIRONMENT

The high-altitude environment, like all others, is a complex of many interrelated factors, but it differs from all others in one respect: reduced atmospheric pressure, which is itself the result of high altitude. This seems to say that the high-altitude environment is characterized by high altitude, but we shall avoid being so foolish by describing some of the effects of reduced atmospheric pressure.

1. Deficient oxygen, the most important characteristic. In the Himalaya at the timberline the oxygen is 68 percent of what it is at sea level; at 6000 m it is only 45 percent. Mountain sheep, ibexes and yaks live up to 5800 m; man without an artificial oxygen supply lives up to 8540 m. Certain insects, mites, and spiders flourish at 6800 m, because they are only slightly affected by decreased oxygen or by sudden changes in atmospheric pressure (Mani 1968:10).

2. Atmospheric cold. While it is true that cold does slow down the activities of insects, high-altitude insects can exist only because of the atmospheric cold: it enables them to withstand the atmospheric aridity (Mani 1968:22-23).

3. Atmospheric aridity.

4. Intense solar radiation. "Regardless of atmospheric temperature, objects exposed to direct sunshine warm up far more rapidly than at sea level" (Mani 1968:21). This is enormously important for insects because of the short days and the short summers.

5. Snow cover. This is absolutely essential for high-altitude insects. It prevents freezing and desiccation and, because the habitat under the snow is not frozen, makes possible an earlier start of summer activities.

6. Biotic factors. (After Mani 1968:44) Most biotic factors are ultimately based on the following:

- (a) Trees are absent.
- (b) The scant caespitose vegetation has a short growing period.
- (c) The active feeding period is severely restricted by the short summer. In the northwestern Himalaya on south slopes the average annual feeding period may last 10 weeks at 3000-4000 m. On north slopes it starts later and is shorter.
- (d) Sources of food are extremely irregular, relatively scant, and often localized.
 - (1) Autochthonous sources are plants and animals normally living at high altitudes.
 - (2) Wind-blown organisms from the lowlands are the predominant source and are most abundant at the melting edges of snow where dead plants and animals (mostly insects) become exposed. The surface of the snow is likewise important; it is almost the exclusive source in the Himalaya above 5000 m.
- (e) Suitable microhabitats are scarce. Actually there are only two of any significance: (1) cracks in the soil and rocks and (2), of far greater importance, under stones.
- (f) Crowding and isolation, caused by this scarcity, may result in "a state of ... armed neutrality rather than peaceful coexistence!" (p. 81)
- (g) The majority of high-altitude insects are predators, parasitoids, or parasites. "It would seem that almost every

member of a high-altitude community spends practically all its time devouring and predating [sic] on every other member species" (pp. 80-81).

- (h) The base of the ecological pyramid is Collembola.
- (i) The fauna is impoverished in number of species (perhaps to only three of four in a community), but the number of individuals per species may be very large.

ANTS RECORDED FROM HIGH ALTITUDES

Weber (1943:341-346) has assembled a list of records with locations and elevations in meters and in feet. The following totals include only workers recorded above 2000 m (=6560 ft), except in North America where for some unexplained reason he includes only those at or above 10,000 ft: the Himalaya 37 species, other Asiatic records 15, Alps 1, North America 16, South America 12, Africa 62.

Gregg (1963) recorded for Colorado 33 species at or above 10,000 ft. In Nevada there are 19 species at or above 10,000 ft.

Fornica picea lochmatteri, which is found at an elevation of 15,749 ft in the Himalaya (Weber 1943:351), is the world's highest known ant. The Nearctic champion is apparently *Fornica neorufibarbis*, which has been taken at 14,260 ft on the summit of Mt. Evans in Colorado (Gregg 1963:533). The Nevada champion is likewise *Fornica neorufibarbis*, taken on Boundary Peak in Esmeralda County at 12,160 ft. (The summit of Boundary Peak is the highest elevation in Nevada: 13,145 ft.)

Deserving special mention here is *Tapi-noma sessile*. Creighton (1950:353) gave its range as "southern Canada and the entire United States with the exception of desert areas in the southwest. The incidence of *sessile* appears to decrease sharply in the Gulf Coast region but it has been taken in Florida, Alabama, Mississippi and Texas." We collected it three times in Deep Canyon near Palm Desert, California (Wheeler and Wheeler 1973:106), which is in the Colorado desert. "The ants have been found to nest all the way from sea level to heights of over 10,000 feet" (Smith 1928:319).

Gregg (1963:446) reported it up to 10,505 ft in Colorado. So the Nevada record of 11,320 ft on Boundary Peak must be the highest not only in Nevada but also anywhere the species is found.

ADAPTATIONS

Because the Arctic-alpine is the harshest terrestrial environment on earth, one may ask what special adaptations permit certain species to live and even thrive in it:

1. Pigmentation. The insects of high altitudes have a large amount of melanin in their integument. The black color enables them to warm up faster and earlier in the morning as well as earlier in the season. This ensures them a longer working period during the all-too-short summer.

2. Atrophy of wings. This enables them to stay in their suitable environment in spite of violent winds. (This does not apply to ants.)

3. Prolonged hibernation. Such species hibernate most of the year and sometimes for two years.

4. Subsurface life. Few species live on the surface. (This does not apply to ants, whose workers may be very active on the surface when conditions are favorable.)

5. Increased clothing. Hairs, scales, and wax are more abundant.

6. Cold stenothermy. High altitude insects are usually active at temperatures near freezing; this prevents dessication. Many develop normally at -1.5 to 5 C (31-41 F) during summer. Some will be killed in a few minutes by exposure to the warmth of a human hand.

ADAPTATIONS OF ANTS

Ants by their very nature are preadapted to life in a wide variety of environments, including some of the harshest on earth. We have discussed elsewhere (Wheeler and Wheeler 1973:7) their preadaptations to another harsh environment, the desert:

1. *Social life*: The cooperation of many individuals is advantageous anywhere in foraging, nest construction, defense, and care of the young.

2. *Nest structure*: Since ants' nests are excavated in the soil, they require no biologically expensive building materials; they are completely flexible as to plan; they are extremely efficient in that they afford a wide range of temperature and moisture conditions, from which the ants can select an optimum.

3. *Nocturnal activity*: Many species are active both day and night and, of course, all ants are able to function in the total darkness of their nests.

4. *Speed*: Many species can run rapidly. This would be especially useful in high altitudes, for there is a lot of work to be done in the short summer.

5. *Omnivorous diet*: The majority of ants are omnivorous; their food consists of insects, honeydew, seeds, and plant exudates.

6. *Integument*: One of the general adaptations of insects to life in any terrestrial environment is an integument that is relatively resistant to water loss. It also aids in the regulation of body temperature, a very important role in small, cold-blooded animals.

Are there, then, any special adaptations of ants for high altitudes? Did evolution need to do any special remodeling before ants could thrive at high altitudes? The answer is no. But color is a preadaptation that becomes especially important at high altitudes. Black and red are common ant colors in all biomes, but there are many ant colors. Among our Alpine Biome ants, however, all species are black or dark brown or a combination of red and black or red and dark brown—colors which absorb heat most rapidly, black being most efficient. Furthermore the bicolored species of *Formica* are polymorphic: the large major workers have the head and thorax (or only the thorax) red, but the gaster is black or dark brown. The smaller workers, however, become progressively more infuscated until the minims are practically black. These small minims warm up and become active earlier in the morning; the larger and redder majors begin work later. If the midday sun becomes too hot for the minims, the majors and medias can keep on working.

MOUNTAIN ANTS OF NORTH AMERICA

Ant faunas are impoverished at high altitudes. Van Pelt (1963:205) found this to be true of the much lower mountains in the Blue Ridge Province of the southeastern United States, where the highest elevation is 6684 ft: "The number of ant forms, and in most cases the numbers of colonies, decreased with increasing altitude."

W. M. Wheeler (1917:460) made much of slope: "In mountain regions slope exposure in its relation to insolation is a very important factor in the local distribution of ants. . . . Northern slopes in the northern hemisphere are usually, for very obvious reasons, almost or quite destitute of ants. . . . [Forel] finds that ants prefer the eastern and southern slopes as these are the situations in which they have the longest day for their activities during the breeding season, since they are early awakened by sufficiently high temperatures of the soil and air from the lethargy induced by the chill night hours, and even though the slope may be in the shade during the afternoon the warmth is sufficient to sustain their activities till sunset. On western slopes, however, the morning hours are too cool and are therefore practically lost to the ants, whereas the afternoon hours are too warm."

Wheeler also stressed the importance of steepness (p. 462). In front of a steep slope facing the sun the heated air rises more rapidly to greater heights before it is cooled to the general temperature of the stratum it penetrates.

Ants "always greatly prefer the more gradual slopes and alpine meadows, probably because the soil of such places retains a more abundant and more equable supply of moisture and because their surfaces are much less exposed to rapid evaporation both from direct insolation and from air-currents" (W. M. Wheeler 1917:462).

If treeless alpine environment is a harsh one, then a forest ought to be a great improvement. But this is not necessarily so. A dense forest with a solid canopy is a hostile environment. "Ecologically significant are those areas in which no ants are found. All of them are above 6000 feet, and almost all occur within forests of spruce-fir or fir" (Van Pelt 1963:221).

If dessication is such a hazard to ants, then a moist environment should be favorable. Again this is not necessarily true. Said W. M. Wheeler (1917:460): "Even moderately low temperatures, when coupled with considerable humidity, a condition which prevails in California during the winter months, is very unfavorable to ants, and when such conditions are most accentuated, the ant-fauna is reduced to a mere remnant, although the vegetation, if the temperature is not too low, may be luxuriant. This is the case in New Zealand where I sometimes searched in vain for an ant-colony in forests whose luxuriance rivalled those of the tropics. But we have a striking example of the depressing effects of cold and moisture on ant-life much nearer home. The cool Selkirk Mts. of British Columbia have an abundant supply of moisture and an unusually rich flora, but their ant-fauna is reduced to a few boreal species. The adjacent Canadian Rockies, however, though in the same latitude, are less humid and have a poorer flora, but their ant-fauna is decidedly richer in species and colonies."

The most favorable environment for mountain ants is an opening in the forest. Here the ants can find insolation or shade, whichever and whenever needed; the correct humidity may be selected; the workers can forage in the opening and/or the forest. They may nest under stones, but additional nesting sites are afforded by fallen dead trees (or branches): under bark, in solid dead wood, in rotten wood, or in the soil under the fallen trunk or branch. In the Alpine Biome they of necessity usually nest under stones, but occasionally thatching ants construct nests with plant debris.

MOUNTAINS OF NEVADA

When we were studying geography in the grades, we visualized the Great Basin as a sort of huge washpan, the bottom a flat plain bordered by mountains. Later in physiography we learned that the Great Basin was a part of the Basin and Range Province, which had mountain ranges rising up from the floor. Still later, when we drove across Nevada and saw a few low ranges, we were not properly impressed. It was

only after we had begun our study of the ants of the state that we were forced to the realization that Nevada is a mountainous state. We proved it to our satisfaction by exploring all parts of the state. We were especially impressed when we stood on the summit of Grant Peak (12,200 ft) and viewed in all directions numerous mountain ranges separated by basins. Perhaps the best confirmation is to view the United States Geological Survey's large (1:500,000) relief map of the state (see fig. 1).

Nevada's topographical uniqueness lies in the fact that most of its surface consists of numerous (more than 300) short, isolated mountain ranges separated by basins—usually called valleys both by local inhabitants and on maps. The floors of some of these basins are 7000 ft above sea level. It seemed strange to us at first to call anything a "valley" if its "floor" is higher than any peak east of the Rocky Mountains (including the Black Hills as part of the Rockies).

Nevada's ranges are subparallel, and their axes generally approach a north-south direction. They are short—50–75 miles (= 80–120 km) long and nearly straight. Not all of them are high, but 43 ranges have peaks between 7000 and 9000 ft; another 54 are above 9000 ft and attain a maximum of 13,140 ft on Boundary Peak.

The higher ranges show biotic zonation, because, with increasing altitude, temperature decreases and precipitation increases from 3 to 30 inches annually. The Alpine Biome (Fig. 2) may be found on the summits of a few of the higher ranges above 10,000 ft. Below the Alpine is the Coniferous Forest Biome (Fig. 3) extending from about 5000 to 11,500 ft. We are inclined to suspect that the mixed bristlecone pine (*Pinus longaeva*) and limber pine (*P. flexilis*) constitute an ecotone (Fig. 4) between the Alpine and Coniferous Forest Biomes. This is especially true of the older forests, which are widely open.

The Alpine Biome is treeless and the plants consist typically of grasses, sedges and forbs. Some of the summits are devoid of plants, having just bare rocks. They are without ants.

Billings (1954) recognized three subdivisions of the coniferous forests of Ne-

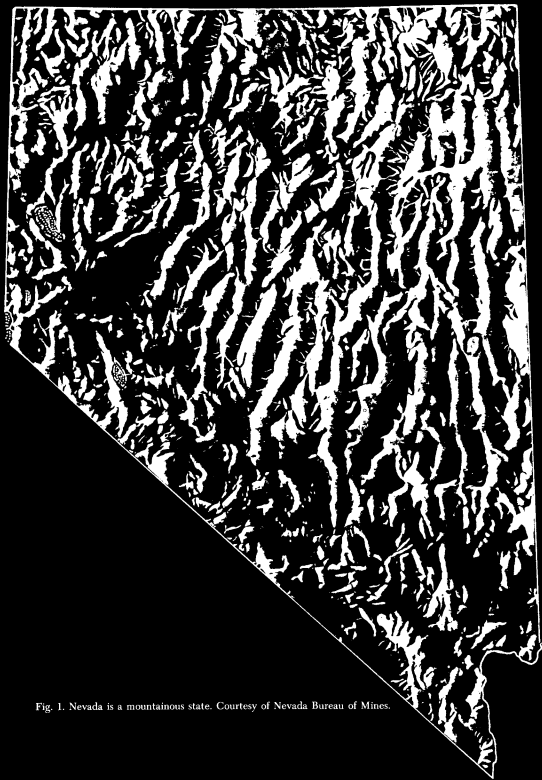


Fig. 1. Nevada is a mountainous state. Courtesy of Nevada Bureau of Mines.

vada; (1) Sierran, (2) Rocky Mountain, and (3) Great Basin.

(1) The Sierran is found only in the Carson Range a few miles south of Reno. The pine-fir zone occurs between 5000 and 7500 ft and comprises large trees from 75 to 200 ft high; it is an open forest dominated by yellow pine (*Pinus ponderosa*), Jeffrey pine (*P. jeffreyi*), and white fir (*Abies concolor*). There is an extensive understory of shrubs, etc.

The next zone (7500-9300 ft) is dominated by red fir (*Abies magnifica*) and may include lodgepole pine (*P. murrayana*), western white pine (*P. monticola*), Jeffrey pine (*P. jeffreyi*), and mountain hemlock (*Tsuga mertensiana*). Aspen (*Populus tremuloides*) often forms groves in moister places. From about 9300 ft to the timberline (about 10,300 ft) is a semi-open patchy subalpine forest. The principal tree is whitebark pine (*P. albicaulis*), which diminishes in height from about 40 ft at 9300 ft to 2 or 3 ft at timberline, where it forms the characteristic krummholz. Other trees are limber pine,

lodgepole pine, and mountain hemlock.

(2) The Rocky Mountain subdivision comprises the eastern ranges from the Jarbidge Mountains in Elko County to the Spring Mountains in Clark County. The complete Rocky Mountain zonal series is (in ascending order): ponderosa pine; Douglas fir (*Pseudotsuga menziesii*), and white fir; subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and often limber pine or bristlecone pine. In most cases one or more zones are missing or zones may be telescoped, producing mixtures.

(3) In Billing's third division the ranges have the simplified forest zones of the Great Basin proper. The Pinyon-Juniper Biome reaches up to 7500-8500 ft. Above this is an almost treeless zone of sagebrush, mountain mahogany (*Cercocarpus ledifolia*), and other shrubs reaching 9500-10,000 ft. Above the treeless zone is an open subalpine forest of limber pine and bristlecone pines, which we regard as ecotone.

In all zones of all three subdivisions mountain streams are bordered by aspen,



Fig. 2. Alpine Biome. Foreground with typical mat vegetation. Esmeralda County: Summit of Boundary Peak in background. Photograph by Gary Nigro.



Fig. 3. Coniferous Forest Biome. Elko County: Snowslide Gulch, Jarbidge Mountains. Photograph by Gary Nigro.

chokecherry (*Prunus virginiana*), water birch (*Betula occidentalis*), willows, and cottonwoods.

MOUNTAIN ANTS OF NEVADA

Because our tentative list of Nevada ants totals 180 species, the list (Table 1) of 50 montane species includes 28 percent of the fauna. But only 30 species are exclusively montane—17 percent of the total, 60 percent of the montane. All 50 montane species occur in the Coniferous Forest Biome. Nineteen of the montane species have been taken in the Ecotone. Five species which have been reported in the Coniferous Forest and in the Alpine have not been taken in the Ecotone, but it is reasonable to assume that they occur here; these would make a hypothetical Ecotone count of 24 species. No species is exclusively Ecotone. Fourteen species have been reported from the Alpine, none of which is exclusive to that biome.

We do not find the ant fauna to be in accord with Billings's subdivisions of the con-

iferous forests of Nevada. Only the Sierran is at all distinctive; six species occur in the Sierra Nevada which occur nowhere else in the state, and conversely there are seven species that do not occur in the Sierra, but are found in many other parts of the state. Most of our montane species are too widely distributed to show any pattern.

Montane species limited in Nevada to the Carson Range of the Sierra Nevada include *Manica bradleyi*, *Stenamma wheelerorum*, *Camptonotus essigi*, *Formica integroides*, *F. microphthalma*, and *F. sibylla*.

Montane species which have not been recorded in Nevada from the Carson Range include *Myrmica emeryana*, *M. lobifrons*, *Manica hunteri*, *Leptothorax crassipilis*, *Lasius vestitus*, *Formica hewitti*, and *F. subnuda*.

Table 1 shows that our montane ants are a relatively unspecialized lot. *Myrmica* comes first on everybody's list of Myrmicinae and *Manica* is second. *Stenamma* and *Aphaenogaster* are not far above them. But



Fig. 4. Ecotone between Alpine and Coniferous Forest biomes. Open stand of bristlecone pines. Clark County: Charleston Peak, Spring Mountains. Photograph by Gary Nigro.

what is *Leptothorax* doing here? It is a moderately specialized myrmicine. *Tapinoma* is somewhat specialized, but it is one of the most versatile ants on earth—it deserves its own paragraph (see above). Among the Formicinae *Camponotus*, *Lasius* and *Formica* rate rather low on the scale of specialization in structure, but they rate much higher in behavior, *Formica* being perhaps the most plastic of all ant genera. *Polyergus* is, by contrast, highly specialized as an obligatory slave-maker. Apparently it can adapt to any environment in which it slaves (*Formica* spp.) can function, although we do not yet have it from the Alpine Biome.

The list is interesting not only for what it contains, but also for what it does not con-

tain: the common genera in the lower biomes of Nevada: *Crematogaster*, *Monomorium*, *Solenopsis*, *Iridomyrmex*, and *Conomyrma*; all the harvesters (*Pogonomymex*, *Veromessor*, and *Pheidole*); and the honey ants (*Myrmecocystus*).

MOUNTAIN ANT NESTS IN NEVADA

Many of our records are based on stray workers only; for these we have no nest data. But those with nests are numerous enough to give a good picture of the nesting habits of Nevada mountain ants. In the following summary we have lumped together the data for all species.

TABLE 1. Mountain Ants of Nevada. A = Alpine; E = Ecotone; C = Coniferous Forest Biome; + = lower biomes (Pinyon-Juniper and/or Cool Desert). We have only one record of a mountain ant from the Hot Desert; even that was riparian.

MYRMICINAE							
<i>Myrmica</i>				<i>Stenamma</i>			
<i>americana</i>	E	C	+	<i>diecki</i>		C	
<i>brevinodis</i>		C		<i>healthi</i>		C	
<i>emeryana</i>	E	C		<i>wheelerorum</i>		C	
<i>fratricornis</i>	E	C		<i>Aphaenogaster</i>			
<i>lobifrons</i>	E	C		<i>occidentalis</i>		C	+
<i>tahoensis</i>		C		<i>Leptothorax</i>			
sp. nov.	A	C		<i>crassipilis</i>		C	
<i>Manica</i>				<i>muscorum</i>	A	E	C
<i>bradleyi</i>		C		<i>nevadensis</i>	A	E	C
<i>hunteri</i>	E	C		<i>nitens</i>		C	+
				<i>rugatulus</i>		C	+
DOLICHODERINAE							
<i>Liometopum</i>				<i>Tapinoma</i>			
<i>luctuosum</i>		C	+	<i>sessile</i>	A	E	C
FORMICINAE							
<i>Camponotus</i>				<i>integroides</i>		C	
<i>essigi</i>		C		<i>lasioides</i>	A	C	+
<i>laevigatus</i>		C		<i>microphthalma</i>		C	
<i>modoc</i>		C		<i>neorufibarbis</i>	A	E	C
<i>vicinus</i>		C	+	<i>nevadensis</i>		C	
<i>Lasius</i>				<i>obscuripes</i>	A	C	+
<i>alienus</i>	A	E	C	<i>obscuricentris</i>	A	C	+
<i>flavus</i>		C		<i>oreas</i>		C	+
<i>neoniger</i>		C	+	<i>planipilis</i>		C	
<i>sitkaensis</i>		C		<i>propinqua</i>		C	+
<i>vestitus</i>		C		<i>puberula</i>		C	
<i>Formica</i>				<i>sibylla</i>		E	C
<i>argentea</i>	A	C	+	<i>subnuda</i>		E	C
<i>dakotensis</i>	A	E	C	<i>subpolita</i>	A	E	C
<i>densiventris</i>		E	C	<i>subsericea</i>		E	C
<i>fuscus</i>	A	E	C	<i>Polyergus</i>			
<i>hewitti</i>	A	E	C	<i>breviceps</i>		E	C

Coniferous Forest Biome: under a stone (mostly) or wood lying on the surface, or usually somewhat buried, 228; in rotten wood, 64; under earthen mounds constructed by the ants, 12; in soil with craters, 15; thatch mounds, 9; thatch and wood, 4.

Ecotone: Under a stone (mostly), or wood lying on the surface, or usually somewhat buried, 42; in rotten wood, 3; in soil with crater, 1.

Alpine: Under a stone lying on the surface or more commonly somewhat buried, 41; in soil with crater, 1; thatch mound, 1.

RECORDS FOR NEVADA MOUNTAIN ANTS

In the following list the arrangement of genera is that of Creighton (1950); for each genus, subgenus, or species-group; the species are arranged alphabetically. Under each species the county name is given first in *italics*; under each county the names of the ranges or mountains are followed by a dash; in each range (or mountain-group) are given the localities (peak or other topographic feature); finally the elevation of the record is given in feet above sea level. See Figure 5 for named localities.

Abbreviations and symbols: Co. = County; Hwy = Highway; mi = miles; Mt. = Mountain; Mts. = Mountains; nr = near; ' = feet. Compass directions are represented by the symbols E, N, S, W, and various combinations thereof. They are understood to be followed by the word *of*; e.g., "5 mi WSW Reno" would be read aloud as "five miles west-southwest of Reno."

When locality is given by legal description, the first figure is the section, the second is the township, and the third is the range. Because all Nevada ranges are east we have not so indicated, but township is cited as north or south; if the section is not known, we have given only township and range. Example: 23-7S-60, if fully expanded would read "section 23, Township 7 South, Range 60 East." The word *range* here has nothing to do with mountain ranges. (If the uninitiated reader is now thoroughly confused, we refer him to Wheeler and Wheeler 1963:76-77.)

Dr. Francoeur has made a preliminary examination of our material included under

Myrmica spp. nov. He thinks we have at least four new species, which he will describe later. We have, therefore, added to each record our field number to make it possible to associate localities with the new names.

SUBFAMILY MYRMICINAE Genus MYRMICA Latreille *Myrmica americana* Weber

Clark Co.: Spring Mts.—Charleston Peak 10,400'. Mineral Co.: Wassuk Ra.—Grant Peak 8000'.

Myrmica brevinodis Emery

Washoe Co.: Carson Ra.—Little Valley 6400'; Hwy 27 nr Mt. Rose 8800'. White Pine Co.: Schell Creek Ra.—North Schell Peak 9700'.

Myrmica emeryana Forel

Clark Co.: Spring Mts.—Charleston Peak 10,400'. White Pine Co.: Schell Creek Ra.—South Schell Peak 9000'.

Myrmica fracticornis Emery

Clark Co.: Spring Mts.—Charleston Peak 8100', 9800'. Elko Co.: Jarbidge Mts.—4 mi S Jarbidge 6600', 6700'. Ruby Mts.—Lamoille Canyon 8200'. Esmeralda Co.: White Mts.—Boundary Peak 9800'. Humboldt Co.: Pine Forest Ra.—Onion Reservoirs 8000'. Nye Co.: Grant Ra.—Troy Peak 10,800'. Washoe Co.: Carson Ra.—Little Valley 6400'; Whites Canyon on Mt. Rose 6800'; Tahoe Meadows on Mt. Rose 8400'. White Pine Co.: Snake Ra.—Mt. Moriah 10,000'; Mt. Washington 10,400'; Wheeler Peak 8300', 10,000', 10,400'.

Myrmica lobifrons Pergande

Elko Co.: Pilot Ra.—Pilot Peak 8800'. Nye Co.: Grant Ra.—Troy Peak 8400'. White Pine Co.: Schell Creek Ra.—North Schell Peak 9800', 10,000'.

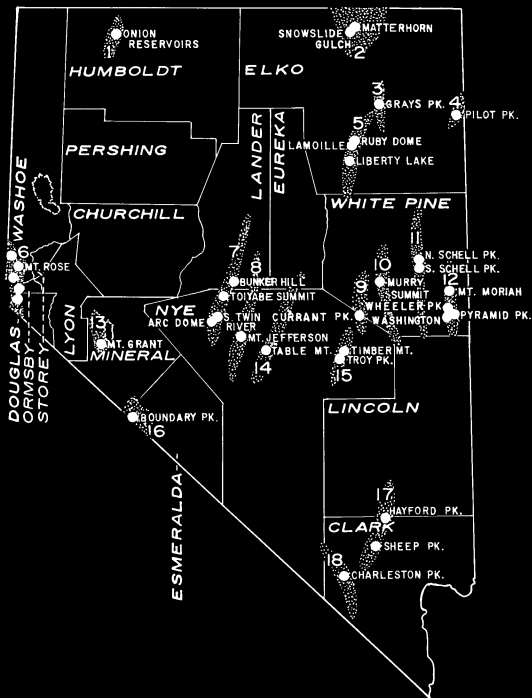


Fig. 5. Nevada localities where mountain ant collections were made.

Myrmica tahoensis W. M. Wheeler

Clark Co.: Spring Mts.—Charleston Park 8100'. Douglas Co.: Carson Ra.—Spooners Summit 7100'. Elko Co.: East Humboldt Ra.—Angel Lake 8 mi SW Wells 7400', 8400'. Ruby Mts.—Lamoille Canyon 8200'. Washoe Co.: Carson Ra.—E side Lake Tahoe at Ormsby Co. line 6600'; between Mt. Rose and Lake Tahoe 8000'; Whites Canyon on Mt. Rose 6800'; Little Valley 6400'.

Myrmica spp. nov.

Elko Co.: Buck Creek Mts.—9 mi WNW Jarbidge 6700' (#2352); Jarbidge Mts.—Snowslide Gulch 9000' (#5229). East Humboldt Ra.—Angel Lake 7 mi SW Wells 7400' (#2506). Esmeralda Co.: White Mts.—Boundary Peak 9000' (#5005, 5025). Lander Co.: Toiyabe Ra.—Bunker Hill 9200' (#5140). Nye Co.: Toiyabe Ra.—South Twin River 8600' (#5161), 8800' (#5162), 9100' (#5154). Toiyabe Ra.—Mt. Jefferson 9400' (#5164). White Pine Co.: Snake Ra.—Pyramid Peak 9800' (#5179), 10,600' (#5173), 10,800' (#5170); Mt. Washington 10,400' (#3104).

Genus MANICA Jurine

Manica bradleyi (W. M. Wheeler)

Douglas Co.: Carson Ra.—7 mi WNW Minden 7000'; Spooners Summit 7100'. Ormsby Co.: Carson Ra.—7 mi WSW Carson City 7000'. Washoe Co.: Carson Ra.—Hobart Creek Reservoir 7200'; Hwy 27 nr Mt. Rose 8800'; Little Valley 6400'; Whites Canyon on Mt. Rose 6800'.

Manica hunteri (W. M. Wheeler)

Elko Co.: East Humboldt Ra.—Angel Lake (8 mi SW Wells) 9000'; Grays Peak 9600'. Ruby Mts.—Lamoille Canyon 7600', 7700', 8200'.

Genus STENAMMA Westwood

Stenamma diecki Emery

Washoe Co.: Carson Ra.—Little Valley 6400'.

Stenamma heathi W. M. Wheeler

Washoe Co.: Carson Ra.—Lake Tahoe 6400'.

Stenamma smithi Cole

Ormsby Co.: Carson Ra.—7 mi WSW Carson City 7000'.

Stenamma wheelerorum Snelling

Washoe Co.: Carson Ra.—Hwy 27 nr Mt. Rose 8800' TYPE NEST.

Genus APHAENOGASTER Mayr

Aphaenogaster occidentalis Emery

Douglas Co.: Carson Ra.—7 mi WNW Minden 7000'. Elko Co.: East Humboldt Ra.—7 mi SW Wells 8400'. Ruby Mts.—Lamoille Canyon 7600'. Ormsby Co.: Carson Ra.—5 mi WSW Carson City 6800'; 7 mi WSW Carson City 7000'. Washoe Co.: Carson Ra.—Franktown Road 5200'; Little Valley 6400', 6600', 7000'; Lower Price Lake 7000'; 6 mi SW Reno 6400'; Upper Price Lake 7200'; 3 mi N Verdi 6100'; 5 mi N Verdi 6900'; Peavine Peak 7400'; N end Lake Tahoe 6400'. White Pine Co.: Snake Ra.—Wheeler Peak 8000'.

Genus LEPTOTHORAX Mayr

Leptothorax crassipilis W. M. Wheeler

Clark Co.: Spring Mts.—Charleston Park 8100'.

Leptothorax muscorum (Nylander)

Douglas Co.: Pine Nut Mts.—17 mi ESE Carson City (23-14N-22) 7600'. Elko Co.: Ruby Mts.—Lamoille Canyon 8200', 9700'. Esmeralda Co.: White Mts.—Boundary Peak 11,000'. Nye Co.: Monitor Ra.—Table Mt. 10,000', 10,500', 10,800'. Washoe Co.: Carson Ra.—Little Valley 6400'; Hwy 27 nr Mt. Rose 8800'; California boundary 31-17N-18 8600'. White Pine Co.: Snake Ra.—Pyramid Peak 9800'; Wheeler Peak 7500'.

Leptothorax nevadensis W. M. Wheeler

Elko Co.: Ruby Mts.—Lamoille Canyon 7000'. *Nye* Co.: Toquima Ra.—S side Mt. Jefferson 10,000'. *Ormsby* Co.: Carson Ra.—3 mi WSW Carson City 6100'. *Washoe* Co.: Carson Ra.—Little Valley 6400', 6500'; Hwy 27 nr Mt. Rose 8800'; 6 mi SW Reno 6400'; 10 mi WNW Reno 6500', 7000'.

Leptothorax nitens Emery

Washoe Co.: Carson Ra.—Little Valley 6400'; 4 mi N Verdi 6300'.

Leptothorax rugatulus Emery

Douglas Co.: Carson Ra.—7 mi WNW Minden 6000', 7000'. *Elko* Co.: East Humboldt Ra.—7 mi SW Wells 7400'. *Nye* Co.: Toquima Ra.—Mt. Jefferson 10,000. *Washoe* Co.: Carson Ra.—Little Valley 6400', 6800'; between Little Valley and Lake Tahoe 7800'; Whites Canyon on Mt. Rose 6800'; 6 mi SW Reno 6400'; 4 mi N Verdi 6300'.

SUBFAMILY DOLICHODERINAE

Genus LIOMETOPUM Mayr

Liometopum luctuosum W. M. Wheeler

Clark Co.: Spring Mts.—Charleston Park 8100'. *Washoe* Co.: Carson Ra.—16-16N-19 5200'; Little Valley 6500', 7100'; Whites Canyon on Mt. Rose 6800'; 6 mi SW Reno 6400'.

Genus TAPINOMA Foerster

Tapinoma sessile (Say)

Clark Co.: Spring Mts.—4 mi NNE Charleston Park 7700'. Sheep Ra.—Hayford Peak 9700', 9900'; Sheep Peak 9700'. *Douglas* Co.: Carson Ra.—Spoooner Summit 7100'. *Elko* Co.: Ruby Mts.—Lamoille Canyon 8200'. Jarbidge Mts.—Pine Creek (-46N-58) 6500'. *Esmeralda* Co.: White Mts.—Boundary Peak 8800', 9000', 11,320'. *Humboldt* Co.: Pine Forest Ra.—Onion Reservoirs 8000'. *Lander* Co.: Toiyabe Ra.—Bunker Hill 7900'. *Nye* Co.: Grant Ra.—Troy Peak 9400'. Toiyabe Ra.—South Twin River (-11N-42) 9200'. *Ormsby* Co.: Carson Ra.—5 mi WSW Carson City 6800'. *Wash-*

oe Co.: Carson Ra.—Little Valley 6400'; Hobart Creek Reservoir 7200'; Lower Price Lake 7000'; 3 mi N Verdi 6100'; 4 mi N Verdi 6300'; 7 mi W Reno; 10 mi NW Reno 6300'; E side Lake Tahoe at Ormsby Co. line 6600'; N end Lake Tahoe at California boundary 8600'. *White Pine* Co.: Egan Ra.—nr Murry Summit 8500', 9200', 9300'. Snake Ra.—Wheeler Peak 8300', 9100', 10,500'.

SUBFAMILY FORMICINAE

Genus CAMPONOTUS Mayr

Subgenus CAMPONOTUS Mayr

Camponotus laevisgatus (F. Smith)

Clark Co.: Spring Mts.—Charleston Park 8100'. *Douglas* Co.: Carson Ra.—E side Lake Tahoe 2 mi S Glenbrook 6400'. *Washoe* Co.: Carson Ra.—California boundary 31-17N-18 8600'.

Camponotus modoc W. M. Wheeler

Clark Co.: Sheep Ra.—peak 1½ mi NE Hayford Peak 9800'. Springs Mts.—Charleston Peak 7700', 8400', 9700'. *Douglas* Co.: Carson Ra.—Spoooner Summit 7100'. E side Lake Tahoe 2 mi S Glenbrook 6400'. *Elko* Co.: East Humboldt Ra.—Grays Peak (-36N-61) 9600'; 7 mi SW Wells 7400'. Ruby Mts.—Ruby Dome 10,500'; Thomas Canyon off Lamoille Canyon 7700'; Liberty Pass (-32N-58) 10,000', 10,300'. Jarbidge Mts.—Snowslide Gulch (-46N-58) 9000'. Pilot Ra.—Pilot Peak 8500', 10,000'. *Humboldt* Co.: Pine Forest Ra.—Onion Reservoirs 8000'. *Lander* Co.: Toiyabe Ra.—Bunker Hill 9300', 9400'. *Nye* Co.: Grant Ra.—Troy Peak 7900', 8900', 9400', 9900', 10,900'. Toiyabe Ra.—South Twin River 9100'. *Washoe* Co.: Carson Ra.—Little Valley 6400'; between Little Valley and Lake Tahoe (24-16N-18) 7800'; Fuller Lake 3 mi S Verdi 6000'; Hwy 27 nr Mr. Rose 8800'; Tahoe Meadows on Mt. Rose 8400'; California boundary 31-17N-18 8600'. *White Pine* Co.: Egan Ra.—nr Murry Summit 9000', 9200'. Schell Creek Ra.—South Schell Peak 8500', 8600', 8800', 9700'; North Schell Peak 9500', 9700', 9800'. Snake Ra.—Mt. Moriah 10,400'; Wheeler Peak 9700', 10,000', 10,700', 12,000'; Pyramid Peak 10,000', 10,500', 10,600'.

Subgenus MYRMENTOMA Forel
Camponotus essigi M. R. Smith

Washoe Co.: Carson Ra.—Little Valley 6600'; Fuller Lake 3 mi S Verdi 6000'; between Little Valley and Lake Tahoe 7800'.

Subgenus TANAEMYRMEX Ashmead
Camponotus vicinus Mayr

Clark Co.: Spring Mts.—Charleston Park 8100'; 16 mi NE Pahrump (-18S-55) 8000'. *Sheep Ra.*—Sheep Peak 9700'. *Douglas Co.*: Carson Ra.—6 mi WNW Minden 6000'. *Elko Co.*: Ruby Mts.—Lamoille Canyon 7700'. Jarbidge Mts.—Snowslide Gulch (-46N-58) 8000'. *Esmeralda Co.*: White Mts.—Boundary Peak 9000'. *Nye Co.*: Grant Ra.—Troy Peak 9100'. *Washoe Co.*: Carson Ra.—Little Valley 6200', 6400', 6500', 6600'; Lower Price Lake 7000'; between Little Valley and Lake Tahoe 7600', 7800'; Fuller Lake 3 mi S Verdi 6000'; E side Lake Tahoe at Ormsby Co. line 6600'; Hwy 27 nr Mt. Rose 8800'; Whites Canyon on Mt. Rose 6800'; 6 mi SW Reno 6400'.

Genus LASIUS Fabricius
 Subgenus LASIUS Fabricius
Lasius alienus (Foerster)

Clark Co.: Spring Mts.—Charleston Park 8100'; Charleston Peak 8300'; 16 mi NE Pahrump 8000'; Camp Bonanza 7500'. *Douglas Co.*: E side Lake Tahoe 2 mi S Glenbrook 6400'. *Elko Co.*: East Humboldt Ra.—Grays Peak (-36N-61) 8900', 9600'; 8 mi SW Wells 8400'. Ruby Mts.—Lamoille Canyon 7700', 8200', 8800', 8900'; Thomas Canyon off Lamoille Canyon 7600', 7700'; Lamoille Creek 8900'; Lamoille Lake 9700'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Lander Co.*: Toiyabe Ra.—Bunker Hill 8900'. *Nye Co.*: Toiyabe Ra.—South Twin River (-11N-42) 8800'. *Washoe Co.*: Carson Ra.—Little Valley 6400'; Whites Canyon on Mt. Rose 6800'.

Lasius neoniger Emery

Clark Co.: Spring Mts.—Charleston Peak 8300'. *Elko Co.*: Ruby Mts.—Thomas Canyon off Lamoille Canyon 7600'. *Nye Co.*:

Toiyabe Ra.—South Twin River (-11N-42) 9000'.

Lasius sitkaensis Pergande

Clark Co.: Spring Mts.—Charleston Park 8100'. *Sheep Ra.*—2 mi N Sheep Peak 9000'. *Douglas Co.*: Carson Ra.—Kingsbury Grade 6 mi WNW Minden; E side Lake Tahoe 2 mi S Glenbrook 6400'. *Elko Co.*: Ruby Mts.—Lamoille Canyon 7600', 7700'. Jarbidge Mts.—Matterhorn 8500'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Washoe Co.*: Carson Ra.—Little Valley 6200', 6400', 6600', 7000'; Fuller Lake 3 mi S Verdi 6000'; California boundary 31-17N-18 8600'. *White Pine Co.*: Egan Ra.—nr Murry Summit 9100'. Schell Creek Ra.—South Schell Peak 8800'. *Snake Ra.*—Wheeler Peak 9700'.

Subgenus CAUTOLASIUS Wilson
Lasius flavus (Fabricius)

Douglas Co.: Carson Ra.—Glenbrook 6200'. *Nye Co.*: Toiyabe Ra.—South Twin River (-11N-42) 9100'. *Washoe Co.*: Carson Ra.—Little Valley 6400'; Hwy 27 nr Mt. Rose 8800'; Lower Price Lake 7000'; Upper Price Lake 7200'; E side Lake Tahoe at Ormsby Co. line 6600'; Mt. Rose 10,000', 10,300', 10,400'. *White Pine Co.*: Snake Ra.—Mt. Moriah 10,000'. *Egan Ra.*—nr Murry Summit 9200'.

Subgenus CHTHONOLASIUS Ruzsky
Lasius vestitus W. M. Wheeler

Clark Co.: Spring Mts.—Charleston Peak 7700', 8100'. *Elko Co.*: Ruby Mts.—Lamoille Canyon 7600'.

Genus FORMICA Linnaeus
 The *neogagates* species-group
Formica lasioides Emery

Clark Co.: Spring Mts.—Charleston Park 8100'; Charleston Peak 8300'; Camp Bonanza 7500'. *Elko Co.*: Jarbidge Mts.—Jarbidge 6200'. East Humboldt Ra.—7 mi SW Wells 7400'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Mineral Co.*:

Wassuk Ra.—-8N-28 8000'. *Nye Co.*: Monitor Ra.—Table Mt. 10,500', 10,600', 10,800', 10,900'. *Washoe Co.*: Carson Ra.—Little Valley 6400', 7000', 7500'; Hwy 27 nr Mt. Rose 8800'; Mt. Rose 10,200', 10,400', 10,500'; Whites Canyon on Mt. Rose (-18N-19) 6800'; 6 mi SW Reno 6400'; 4 mi N Verdi 6300'. *White Pine Co.*: Schell Creek Ra.—South Schell Peak 8900'. Snake Ra.—Mt. Moriah 10,500'; Mt. Washington 10,400'.

The rufa species-group
Formica dakotensis Emery

Nye Co.: Monitor Ra.—Table Mt. (E side) 10,800'. *Washoe Co.*: Carson Ra.—Mt. Rose (15-17N-18), 10,500'. *White Pine Co.*: Snake Ra.—Wheeler Peak 10,000', 10,500'.

Formica densiventris Viereck

Elko Co.: Ruby Mts.—base of Ruby Dome 7200'. *Esmeralda Co.*: White Mts.—Boundary Peak 8900'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Nye Co.*: Toquima Ra.—ridge S of Mt. Jefferson 10,000'. *Washoe Co.*: Carson Ra.—between Little Valley and Lake Tahoe 7800'; Hwy 27 nr Mt. Rose 8800'.

Formica integroides W. M. Wheeler

Washoe Co.: Carson Ra.—10 mi W Reno 6500', 7000'; 6 mi SW Reno 6400'; 4 mi N Verdi 6300'.

Formica nevadensis W. M. Wheeler

Esmeralda Co.: White Mts.—Boundary Peak 9000'. *Washoe Co.*: Carson Ra.—Whites Canyon on Mt. Rose 6800'; "Lake Tahoe." *White Pine Co.*: Schell Creek Ra.—North Schell Peak 10,400'.

Formica obscuripes Forel

Elko Co.: Ruby Mts.—Thomas Canyon off Lamoille Canyon 7700'. *Nye Co.*: Toquima Ra.—S side Mt. Jefferson 10,500'. *Washoe Co.*: Carson Ra.—Little Valley 6400', 6500'; Marlette Lake 8000'. *White Pine Co.*: Egan

Ra.—10 mi SW Ely (-14N-62) 10,000'; nr Murry Summit 8600', 8800'.

Formica obscuriventris Mayr

Humboldt Co.: Pine Forest Ra.—Onion Reservoirs 8000'. *Washoe Co.*: Carson Ra.—4 mi N Verdi 6300'; Tahoe Meadows on Mt. Rose 8400'. *White Pine Co.*: Egan Ra.—10 mi SSW Ely 10,000'.

Formica oreas W. M. Wheeler

Elko Co.: Ruby Mts.—end of Lamoille Canyon road 8800'. *Washoe Co.*: Carson Ra.—Little Valley 6400'; Hobart Creek Reservoir 7200'.

Formica planipilis Creighton

Elko Co.: Ruby Mts.—Lamoille Canyon 8800'; Lee Lake on Lee Peak 9700'. Jarbidge Mts.—Snowslide Gulch 8000'. *Washoe Co.*: Carson Ra.—Fuller Lake (32-14N-18) 6000'. *White Pine Co.*: Schell Creek Ra.—1 mi W North Schell Peak 10,200'; Berry Creek on South Schell Peak 8800'. Snake Ra.—NE slope Wheeler Peak 8300'.

Formica propinqua W. M. Wheeler

Washoe Co.: Carson Ra.—Little Valley 6400'; Lower Price Lake 7000'; between Little Valley and Lake Tahoe 7600', 7800'; Hobart Creek Reservoir 7200'; 5 mi SW Reno 5600'.

The fusca species-group
Formica argentea W. M. Wheeler

Clark Co.: Springs Mts.—Charleston Peak 8100', 8300', 8400', 9700', 10,300', 10,400'; Mummy Mt. 10,800', 11,500'. Sheep Ra.—Hayford Peak 9700'. *Elko Co.*: Jarbidge Mts.—Jarbidge 6200'. Ruby Mts.—Lamoille Creek 8800'. *Esmeralda Co.*: White Mts.—ridge 2½ mi NE Boundary Peak 10,800'. *Mineral Co.*: Wassuk Ra.—-8N-28 8000'. *Nye Co.*: Grant Ra.—ridge between Timber Mt. and Troy Peak 10,000'; Troy Peak 7400', 7900'. Toiyabe Ra.—South Twin River 9100'. Toquima Ra.—Mt. Jefferson

10,000'. *Ormsby Co.*: Carson Ra.—5 mi WSW Carson City 6800'. *Washoe Co.*: Carson Ra.—Marlette Lake 8000'; Little Valley 6400'; between Little Valley and Lake Tahoe 7600'. *White Pine Co.*: Schell Creek Ra.—North Schell Peak 9700'; South Schell Peak 8800'. *Snake Ra.*—Wheeler Peak 9700'; Pyramid Peak 9200', 9400'.

Formica fusca Linnaeus

Douglas Co.: Carson Ra.—Kingsbury Grade 7000'; Spooner Summit 7100'. *Elko Co.*: Ruby Mts.—Lee Peak 11,000'; Ruby Dome 10,500', 11,000'; Thomas Canyon off Lamoille Canyon 7700'; Lamoille Lake 9700'; nr Liberty Lake 10,000'; Liberty Lake 10,300'; Liberty Pass 10,400'. Jarbidge Mts.—Matterhorn 10,200', 10,300'; Snowslide Gulch 9200'. East Humboldt Ra.—Grays Peak 9900'. Pilot Ra.—Pilot Peak 8500'. *Esmeralda Co.*: White Mts.—2½ mi NE Boundary Peak 10,800'; Boundary Peak 10,500'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Lander Co.*: Toiyabe Ra.—Bunker Hill 9300', 9700', 10,200'. *Mineral Co.*: Wassuk Ra.—Mt. Grant 10,200'. *Nye Co.*: Grant Ra.—Troy Peak 9900', 10,100', 10,800', 10,900', 11,200'; Timber Mt. 10,200', 10,400'. Toiyabe Ra.—Toiyabe Dome 10,100', 10,500'; between Arc Dome and Toiyabe Dome 9800'; South Twin River 9000'. *Ormsby Co.*: Carson Ra.—3 mi WSW Carson City 6100'. *Washoe Co.*: Carson Ra.—Little Valley 6400', 6500', 6600'; Hobart Creek Reservoir 7200'; between Little Valley and Lake Tahoe 7800'; Marlette Lake 8000'; Hwy 27 nr Mt. Rose 8800', 9100'; Lower Price Lake 7000'; Mt. Rose 10,000', 10,200', 10,300', 10,500', summit (10,778'); Whites Canyon on Mt. Rose 6800'. *White Pine Co.*: White Pine Mts.—Currant Mt. 10,700', 10,800', 11,200'. *Snake Ra.*—Wheeler Peak 10,000', 10,500', 10,700', 10,800', 11,100'; Mt. Moriah 10,400', 10,500', 10,800', 11,400', 11,500'; Pyramid Peak 10,500', 10,800'. Schell Creek Ra.—North Schell Peak 10,300', 10,400', 10,500'; South Schell Peak 9700'.

Formica hewitti W. M. Wheeler

Elko Co.: Buck Creek Mts.—9 mi NW

Jarbidge 6700'. *Esmeralda Co.*: White Mts.—N slope of peak N of Boundary Peak 11,600'; Boundary Peak 11,000'. *Mineral Co.*: Wassuk Ra.—Mt. Grant 11,000'. *White Pine Co.*: Snake Ra.—Wheeler Peak 10,100'; Pyramid Peak 9800'.

Formica microphthalmalpa Francoeur

Douglas Co.: Carson Ra.—Kingsbury Grade 7000'. *Washoe Co.*: Carson Ra.—between Little Valley and Lake Tahoe 7600'; Hwy 27 nr Mt. Rose 8800'.

Formica neorufibarbis Emery

Clark Co.: Sheep Ra.—Hayford Peak 9800'. *Douglas Co.*: Carson Ra.—Spooner Summit 7100'. *Elko Co.*: Ruby Mts.—end of Lamoille Canyon road 8800'; Lamoille Creek 9200'. East Humboldt Ra.—Angel Lake 8400'; Grays Peak (-36N-61) 10,500'. Jarbidge Mts.—Jarbidge 6200'. Buck Creek Mts.—9 mi WNW Jarbidge 6700'. *Esmeralda Co.*: White Mts.—Boundary Peak 11,000', 11,600', 12,000', 12,200'. *Humboldt Co.*: Pine Forest Ra.—Onion Reservoirs 8000'. *Mineral Co.*: Wassuk Ra.—Mt. Grant 11,000'. *Nye Co.*: Toiyabe Ra.—Mt. Jefferson 11,700', 11,800', 11,900'. Toiyabe Ra.—Arc Dome 11,200', 11,500', 11,600', 11,700', summit (11,775'). *Washoe Co.*: Carson Ra.—Little Valley 6400'; Hobart Creek Reservoir 7200'; Hwy 27 nr Mt. Rose 8700', 8800'; Tahoe Meadows on Mt. Rose 8400'; Mt. Rose 10,400', 10,500', 10,700', summit (10,778'). *White Pine Co.*: Snake Ra.—Mt. Moriah 11,000', 11,100'; Wheeler Peak 9700'. Schell Creek Ra.—North Schell Peak 9000', 10,500'; South Schell Peak 8600', 8800', 9900'.

Formica sibylla W. M. Wheeler

Douglas Co.: Carson Ra.—6 mi WNW Minden 6000'. *Ormsby Co.*: Carson Ra.—5 mi SW Carson City 7100'; 7 mi WSW Carson City 7000'. *Washoe Co.*: Carson Ra.—Little Valley 6400', 6800', 6900', 7000', 7500'; Hwy 27 nr Mt. Rose 9000'; Mt. Rose 10,500'; Whites Canyon on Mt. Rose 6800'; 6 mi SW Reno 6400'; Sand Point E side Lake Tahoe 6400'; Marlette Lake 8000'; Lower Price Lake 7000'.

Formica subpolita Mayr

Clark Co.: Sheep Ra.—Hayford Peak 9700', 9900'; Sheep Peak 9000', 9700'. Esmeralda Co.: White Mts.—Boundary Peak 10,800'. Humboldt Co.: Pine Forest Ra.—Onion Reservoirs 8000'. Mineral Co.: Wasuk Ra.—Mt. Grant 10,200'. Nye Co.: Toiyabe Ra.—Arc Dome 9200'; South Twin River 8800', 9100', 9200'. Toiyabe Ra.—Mt. Jefferson 9400', 9500', 10,000'. Washoe Co.: Carson Ra.—Fuller Lake (3 mi S Verdi) 6000'; 6 mi SW Reno 6400'; 10 mi WNW Reno 6500', 7000'.

Formica subsericea Say

Clark Co.: Spring Mts.—Charleston Peak 10,400', 11,000'; Mummy Mt. 11,500'. Sheep Ra.—Hayford Peak 9700'. Elko Co.: Ruby Mts.—end of Lamoille Canyon road 8800'; Lamoille Canyon 7600'; Thomas Canyon off Lamoille Canyon 7700'. East Humboldt Ra.—Angel Lake 8400'; Grays Peak 9000'. Humboldt Co.: Pine Forest Ra.—Onion Reservoirs 8000'. Nye Co.: Grant Ra.—Troy Peak 8800', 9000', 10,700'. Monitor Ra.—Table Mt. 9500'. Toiyabe Ra.—South Twin River 8800'. Ormsby Co.: Carson Ra.—7 mi WSW Carson City 7000'. Washoe Co.: Carson Ra.—Hwy 27 nr Mt. Rose 8800'; Mt. Rose 10,300', 10,500'. White Pine Co.: Snake Ra.—Mt. Washington 9500'; Wheeler Peak 7500', 8000'. Egan Ra.—nr Murry Summit 9200'.

The *sanguinea* species-group
Formica puberula Emery

Elko Co.: Ruby Mts.—Thomas Canyon off Lamoille Canyon 7600'; Lamoille Canyon 8200'. Washoe Co.: Carson Ra.—Little Valley 6400'.

Formica subnuda Emery

Elko Co.: East Humboldt Ra.—8 mi SW Wells 8400'; Grays Peak 9000'. Ruby Mts.—Ruby Dome 10,500'; Lamoille Canyon 8200'; Liberty Pass 10,300'. White Pine Co.: Snake Ra.—Wheeler Peak 10,000', 10,500'; saddle between Mt. Washington and Lincoln Peak 11,000'; Mt. Washington 10,400'; Pyramid Peak 9900', 10,500', 10,600'. Schell Creek Ra.—North Schell Peak 9900', 10,600'.

Genus *Polyergus* Latreille*Polyergus breviceps* Emery

Elko Co.: Ruby Mts.—Ruby Dome 10,500'. Nye Co.: Grant Ra.—Troy Peak 7400'. Washoe Co.: Carson Ra.—Little Valley 6400', 6500'; Hwy 27 nr Mt. Rose 8800', 9100'; 6 mi SW Reno 6400'.

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